

## CLAIMS

We claim:

1. A fuel cell electrode comprising:  
a support structure comprising bacterial cellulose; and  
a catalyst disposed in or on the support structure, the catalyst being  
selected from transition metals.
2. The fuel cell electrode of claim 1 wherein:  
the catalyst is selected from platinum group metals.
3. The fuel cell electrode of claim 1 wherein:  
the catalyst is palladium.
4. The fuel cell electrode of claim 1 further comprising:  
an electrically conductive current carrier that contacts the support structure.
5. The fuel cell electrode of claim 1 wherein:  
the support structure consists essentially of bacterial cellulose.
6. The fuel cell electrode of claim 1 further comprising:  
an enzyme disposed in or on the support structure.
7. A method for recovering the catalyst from the fuel cell electrode of  
claim 1 comprising burning or hydrolyzing the support structure.
8. An electrolyte membrane for a fuel cell, the electrolyte membrane  
comprising:  
a support structure comprising bacterial cellulose; and  
a metal salt disposed in or on the support structure.
9. The electrolyte membrane of claim 8 wherein:  
the metal salt is selected from alkali metal salts.

10. The electrolyte membrane of claim 8 further comprising:  
a sulfonated polymer disposed in or on the support structure.
11. The electrolyte membrane of claim 10 wherein:  
the sulfonated polymer is carrageenan.
12. A fuel cell comprising:  
an electrolyte membrane comprising a membrane support structure  
comprising bacterial cellulose;  
an anode disposed on one side of the electrolyte membrane; and  
a cathode disposed on an opposite side of the electrolyte membrane,  
wherein at least one of the anode and the cathode comprises an electrode  
support structure comprising bacterial cellulose, and a catalyst disposed in or on  
the electrode support structure.
13. The fuel cell of claim 12 wherein:  
the catalyst is selected from platinum group metals.
14. The fuel cell of claim 12 wherein:  
the catalyst is palladium.
15. The fuel cell of claim 12 wherein:  
a metal salt<sup>is</sup><sub>^</sub> disposed in or on the membrane support structure.
16. The fuel cell of claim 12 wherein:  
a sulfonated polymer is disposed in or on the support structure.
17. A method for impregnating bacterial cellulose with a metal, the  
method comprising:  
preparing a matrix comprising bacterial cellulose; and  
placing the matrix in a solution of a metal salt for a sufficient time period  
such that the metal salt is reduced to metallic form and the metal precipitates in or  
on the matrix.

18. The method of claim 17 wherein:  
the metal salt is selected from coordination compounds including a platinum metal group complex ion, and mixtures thereof.

19. A method for forming a fuel cell, the method comprising:  
preparing an electrode support structure comprising hydrated bacterial cellulose;  
placing the electrode support structure in a solution of a metal salt for a sufficient time period such that the metal salt is reduced to metallic form and the metal precipitates in or on the electrode support structure;  
dehydrating the electrode support structure to form an electrode material;  
dividing the electrode material into an anode and a cathode;  
preparing a membrane support structure comprising hydrated bacterial cellulose;  
placing the anode on one side of the membrane support structure;  
placing the cathode on an opposite side of the membrane support structure; and  
dehydrating the membrane support structure thereby affixing the anode and the cathode to the membrane support structure.

20. The method of claim 19 wherein:  
the metal salt is selected from coordination compounds including a platinum metal group complex ion, and mixtures thereof.